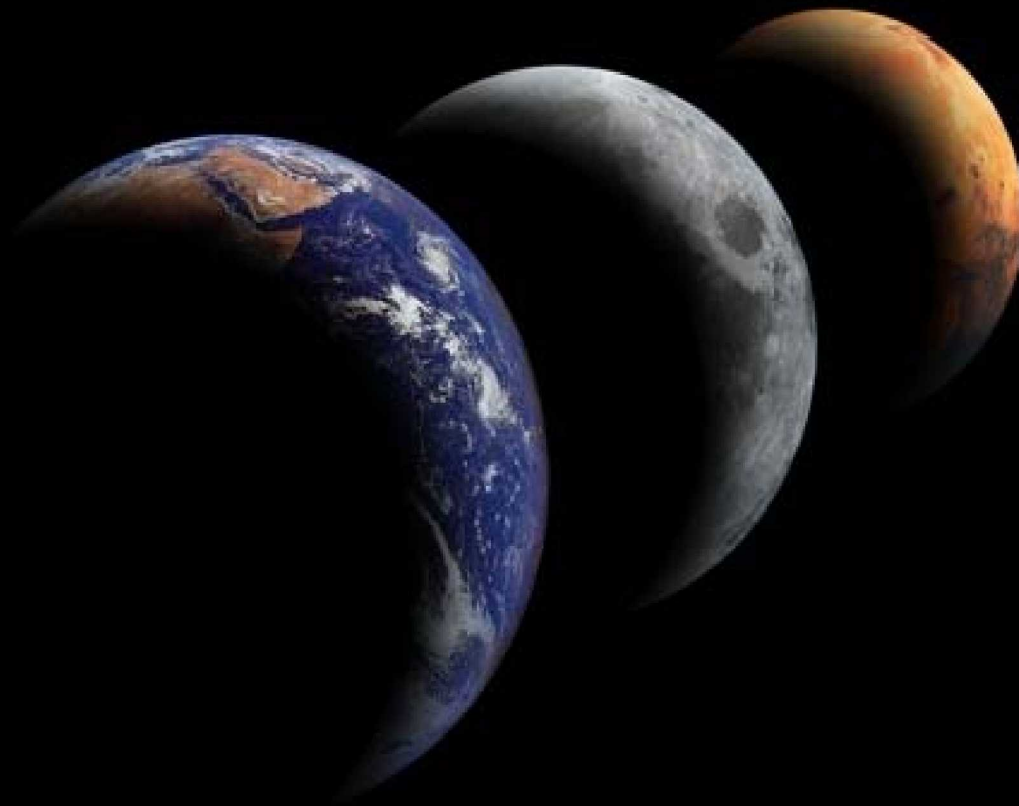


Space Commercialization



Gary Martin

Director, New Venture and Communication
Ames Research Center

Dr. John Olson

Exploration Systems
NASA Headquarters



Space commercialization is necessary to fulfill national goals and the associated policy and strategic objectives that will enable space exploration and development

“We can inspire and open the door for commercial entrepreneurial entities to become involved, to become partners with NASA.”

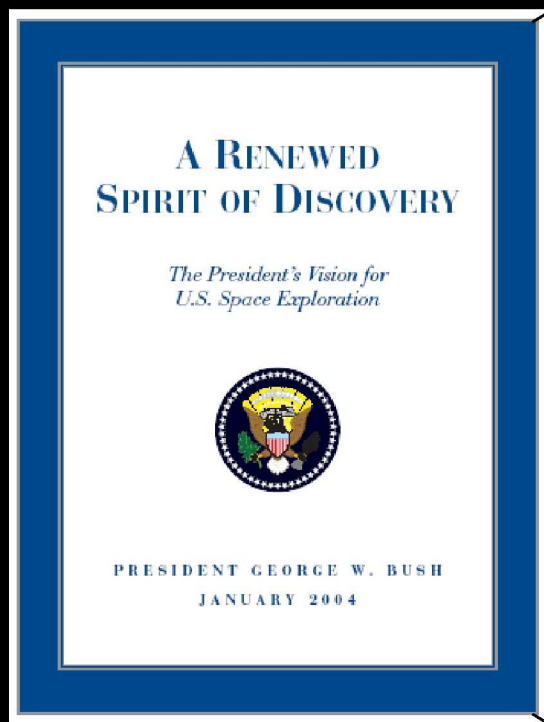
Charles F. Bolden, Jr.
NASA Administrator



U.S. Space Exploration Policy



THE FUNDAMENTAL GOAL OF THIS VISION IS TO ADVANCE U.S. SCIENTIFIC, SECURITY, AND ECONOMIC INTEREST THROUGH A ROBUST SPACE EXPLORATION PROGRAM



Implement a **sustained** and affordable human and robotic program to explore the solar system and beyond

Extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations;

Develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about the destinations for human exploration; and

Promote international and **commercial participation** in exploration to further U.S. scientific, security, and **economic interests.**



Current Approach



- **Government-led exploration**
 - New Ares transportation system first ISS then the Moon, also part of the Mars architecture
 - Developing Lunar surface systems, such as, suits, habitats and rovers to explore the surface of the Moon
 - First humans to return to the Moon will be groups of government workers - astronauts - and the missions will be government science and applications missions
- **Ares costs will not be low enough to spark private development in space and the issue of property rights is not expected to be important to these early government missions**



Commercialization Definition



- **Definition:** Use of equipment sent into or through space to provide goods or services of commercial value, either by a corporation or government, in a climate conducive to expanded private sector investment and involvement in space activities
- **Types:**
 - Gov't or private purchase of products, goods or services
 - Commercial end-to-end responsibility
 - Public-private partnerships (PPPs)
 - Cooperative or joint R&D
 - Commercially-leveraged gov't investment (NACA model)
 - Cooperative development (COTS)
 - Contractual purchase (CRS)
 - Planning and development (CCDev)



Space Commercialization Strategic Objectives



- **Open the space frontier for a broader segment of the population, such that increasing large numbers of the American people can play, work & live in space**
- **Achieve low-cost and reliable access to space**
- **Enable responsive space operations**
- **Ensure best value for the Nation and taxpayers**
- **Continually pursue improved safety and mission success in an affordable manner.**
- **Produce dual-use benefits for economic and national security**
- **Sustain existing high-quality jobs and create new high-wage jobs**
- **Stimulate and enable new commercial space markets, and orbital capabilities beyond access to orbit both in the near and long term**



Space Commercialization Strategic Objectives



- **Enable space-based infrastructure (e.g., orbital transfer services; on-orbit servicing, inspection, repair; orbital debris clean-up capabilities; lunar cargo, navigation and communications, propellant depots; and near-Earth object resource extraction)**
- **Inspire the next generation of scientists, engineers, teachers, and explorers**
- **Provide students, scientists, and researchers with new low-cost access to space capabilities**
- **Produce significant reductions or game-changing innovations in the cost, performance, safety, and/or sustainability of human exploration of space**
- **Help new markets, capabilities and services become self-sustaining**



Exploration Themes



Human Civilization



Scientific Knowledge



Exploration Preparation



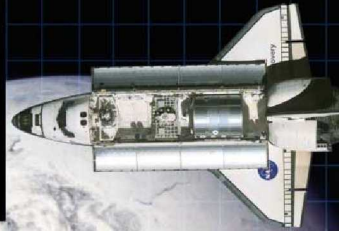
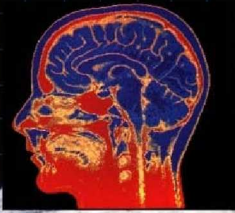
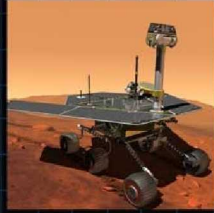
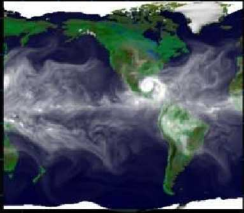
Global Partnerships



Economic Expansion



Public Engagement



**Value
exceeds
1% of the
nation's
GDP**

FAA Report

**\$23B and
\$139B when
secondary
and tertiary
industries
are included**

FAA Report:

2009 Space Report:

The global space economy grew 2.5 percent in 2008, rising by \$6 billion to \$257 billion in worldwide space revenues.





NASA Criteria for Commercial Engagement



To Act as Stimulus, Enabler, and Catalysts for Growth:

- 1. Determine the value proposition to NASA and the government.**
- 2. Assess or determine the responsiveness (agility) of the potential options**
- 3. Allocate appropriate market or scope such that government does not compete with industry. Careful consideration of balance between the promotion of competition, innovation, and efficiency should be applied.**
- 4. Is the approach innovative or substantially differentiated by cost, schedule, performance, value, ease, or some other resource or constraint limitation?**



5 Principles to Strengthen Commercial Space Industry



- 1. Create True Partnerships**
- 2. Lower Barriers to Entry**
- 3. Establish Tax and Investment Incentives**
- 4. Create Policy and Laws to Protect Space Investments**
- 5. Create a Diverse Portfolio**



Private Entrepreneurship



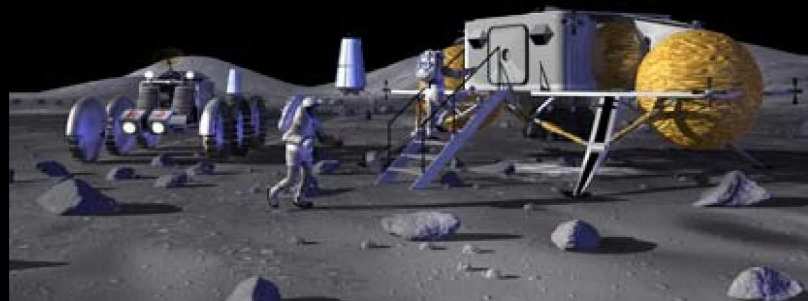
- **Google Lunar X-PRIZE**
 - Cash prize of \$30 million, '*...for the first privately funded team to send a robot to the moon, travel 500 meters and transmit video, images and data back to the Earth.*'
- **Private enterprise becoming a new force toward opening space**
- **Competing companies have developed business plans that are not completely dependent on winning the prize**
- **Provide robotic services and data to governments and private industry**



NACA Model



- **Before NASA, there was the National Advisory Committee for Aeronautics (NACA)**
 - Development of key technologies, to enabled air travel to become effective, economical and safe
 - Study the problems of flight to identify and resolve the risks that were keeping air travel from being safe and commercially viable
 - Government worked closely with industry to fund studies that retired technological risks and enabled private enterprise to successfully create a new industry
- **Under this model, NASA could develop and retire the risks of new technologies to enable space transportation, private companies could incorporate the work into their own designs**



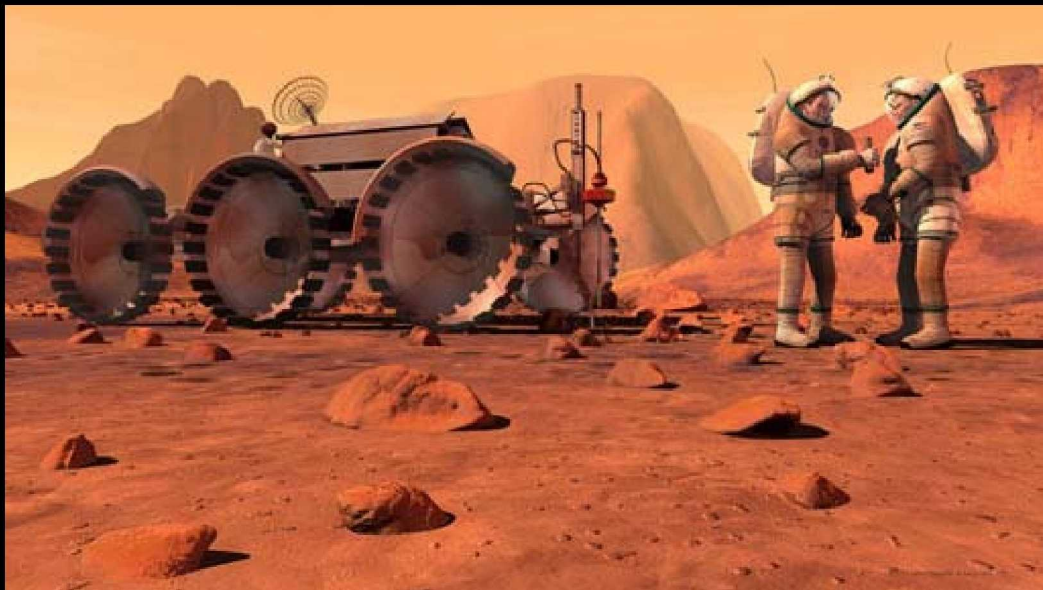


Rights to Use Space Resources



- **Outer Space Treaty - 1967**

- Precludes sovereignty over off-world territory by nations
- Principle of property rights in space is not clearly defined
- Most likely world governments would not recognize any claims of rights - serious risk that investments would be challenged under the current framework





Resources for Development



- **Transcontinental railroad was developed and built by private industry, which was, in turn, subsidized by government property rights grants to the companies along the railroad route.**
 - In 1862 the Congress passed the Pacific Railroad Act, which provided the railroads with 400-foot right-of-ways and ten square miles of land for every mile of track built
 - The land was granted in checkerboard fashion, not contiguous, and was provided in lieu of cash to finance the construction of the railroad.
 - The train companies were able to realize a return on their investment and raise construction capital by selling land to settlers.
- **Space transportation companies that are provided property rights can recover the transportation costs of settlers or space tourists traveling to Mars or the Moon**



Rights to Utilize Resources



- Mining of the ocean bottom in international waters for hard minerals
 - Deep Seabed Hard Mineral Resource Act 1980
 - U.S. issues its own licenses and permits and *'ensures protection of the marine environment, safety of life and property at sea, prevention of unreasonable interference with other uses of the high sea and conservation of mineral resources'*

- Establish international regime to manage licensing or permit system to protect the rights of individuals and companies in space
- Provide stronger protection for investors, recognition from many countries to the regime's right to oversee the use of space resources.

Conclusion

- **There will be sustainable settlements in space**
- **U.S. Space Exploration Policy provides context for the role that government will play in taking those first steps off Earth**
- **Space development must be done by private industry**

